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ABSTRACT

This study used 10 years of personnel data of Michigan State University faculty to explore the returns in salary to seniority (the wage-tenure profile) and the degree to which these returns respond to entry-level salaries (or opportunity wages). Elasticities of senior-faculty salaries were estimated with respect to entry-level salaries, and findings indicated that these elasticities declined with seniority. Results suggest that the wage-tenure profile may be sensitive to market conditions at the entry level of each academic field. The evidence provides an explanation of faculty salary compression and suggests the importance of controlling for entry-level salaries in obtaining estimates of the returns to seniority. Tables give data relating to definition of variables, average salaries for faculty, estimated earnings for tenured men and tenured women, returns to seniority and postdoctoral experience, elasticity with respect to entry level salary, and wage-tenure profiles. (Contains 23 references.) (PRW)

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Seniority, External Labor Markets, and Faculty Pay

Upjohn Institute Staff Working Paper 95-37

Byron W. Brown and Stephen A. Woodbury

July 1995

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Seniority, External Labor Markets, and Faculty Pay

Abstract

We estimate the returns to seniority (the wage-tenure profile) for university faculty, and the degree to which these returns respond to entry-level salaries (or opportunity wages)—a relationship unexplored in work to date. Using data on faculty at a Big Ten university (ours), we estimate elasticities of senior-faculty salaries with respect to entry-level salaries, and find that these elasticities decline with seniority. The evidence both provides an explanation of faculty salary compression and suggests the importance of controlling for entry-level salaries in obtaining estimates of the returns to seniority.

Seniority, External Labor Markets, and Faculty Pay

Byron W. Brown and Stephen A. Woodbury

A growing literature has examined the relationship between seniority with a given employer and pay—the wage-tenure profile. The importance of this literature lies in its implications about the relationship between pay and productivity: Human capital theory suggests that the rising wage-tenure profile represents the returns to firm-specific investment by workers, typically shared by the employer (Becker 1975; Oi 1962; Hashimoto 1981). Although evidence marshalled by Brown (1989) and Topel (1991) supports this view, others have suggested that the rising wage-tenure profile represents the effects of good job matches (Jovanovic 1979; Abraham and Farber 1987; Altonji and Shakotko 1987) or the efforts of employers to motivate workers (Lazear 1981; Hutchens 1987). These matters are of more than academic interest: If firm-specific human capital cannot account for the rising wage-tenure profile, then the costs of losing a job are far lower than would otherwise be the case. With skills that are general and portable, a worker who loses his or her job as a result of structural change in the economy should be able to transport those skills to another job and obtain a comparable wage. The need to compensate a dislocated worker for lost firm-specific skills would vanish.[1]

Work on the academic labor market by Ransom (1993) and Hallock (1995) suggests that, for at least one segment of the labor market, salaries actually *fall* with job tenure, raising additional questions about issues surrounding the wage-tenure profile. In particular, Ransom suggests that mobility costs of faculty and monopsony power exercised by universities are responsible for the declining returns to seniority that are experienced by university faculty. Hallock, however, raises some doubts about the generality of the declining wage-tenure profile for university faculty.

In this paper, we present evidence that supports Ransom's finding of a negative return to job tenure for faculty. More important, perhaps, we add a new wrinkle by examining how changes in entry-level salaries are transmitted to senior faculty. This new evidence on how the external labor market affects the wage-tenure profile is important for three reasons. First, it suggests that, in general, the wage-tenure profile may be sensitive to market conditions at the entry level of a workers' occupation. Second, it helps explain the severe salary compression that occurred in academe during the 1980s; that is, the narrowing of the pay gap between junior and senior faculty. Third, it provides evidence of a link between external and internal labor markets that has not been documented to date.[2]

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[1] For evidence that dislocated workers do lose much in the process of dislocation, and for a discussion of appropriate policies, see Jacobson, LaLonde, and Sullivan (1993a,b,c).

[2] For a review of the large literature on internal labor markets, see Osterman (1994).

We examine the returns to seniority by analyzing a ten-year file of personnel data on individual faculty at Michigan State University (MSU). For 1981, 1986, and 1990, we estimate salary equations that allow us to detect dramatic changes in the structure of faculty pay determination over the decade of the 1980s. In particular, we examine changes in the returns to seniority at MSU (or job tenure) and find that the wage-tenure profile, which began the decade by falling moderately for faculty men and rising for faculty women, collapsed and was falling for both men and women by the end of the decade (section III.A).

In order to estimate how changes in entry-level salaries are transmitted to senior faculty, we augment the MSU faculty salary data with market salary data for each academic field from American Association of Universities (AAU) member institutions. Using these data we estimate the elasticity of senior faculty pay with respect to entry-level salaries, and find that this elasticity varies with seniority, over time, and by gender (section III.B). Finally, we show that faculty wage-tenure profiles are sensitive to labor market conditions at the entry-level of each academic field (section III.C).

I. Data and Approach

To examine the returns to seniority and the transmission of entry-level salaries to more senior faculty, we use data from computerized personnel records on all Michigan State University (MSU) faculty as of October 1 in each year in 1981, 1986, and 1990. For present purposes, it is simplest to think of these data as separate annual cross sections of faculty records. The information available on each faculty member includes individual characteristics such as gender, ethnicity, and birth year, as well as variables on faculty status such as salary, rank, year of appointment, percent of time employed, departmental unit, highest degree earned, year in which the highest degree was earned, veteran status, and handicapper status. Although we use most of these data directly, they allow us in addition to construct unusually rich measures of labor market experience that can be interpreted within a human capital framework.

We supplement these MSU personnel records with data on average salary of assistant professors in each faculty member's field at other American Association of Universities (AAU) institutions (see below). The AAU data on entry-level market salaries provide a measure of the market opportunities facing each faculty member we observe.

The only obvious deficiency of this data set is the lack of information on productivity—measures of research output and teaching competence, for example. MSU does not maintain a centralized file of such information, and the cost (to us) of building such records would be prohibitive. Nevertheless, it will turn out that roughly 60 to 70 percent of the cross-sectional variation in tenure system faculty salaries can be explained with the data that *are* available to us. This ability to explain so much of the variation in faculty salaries without additional controls for productivity is striking in itself.

Our analysis of these data proceeds as follows. In section II we specify a salary function for three annual cross sections of data—1981, 1986, and 1990. For each year we partition the sample into two sub-groups—tenure system faculty men and tenure system faculty women (we do not consider temporary faculty because job tenure for temporary faculty is by definition limited). Estimates of these salary functions, reported in section III, yield evidence of changes in the structure of faculty pay over the decade of the 1980s—the returns to seniority, the transmission of the entry-level salary in a field to faculty with up to 25 years of seniority, and the sensitivity of wage-tenure profiles to entry-level salaries.

II. Salary Functions

The models we estimate are based on the well-known earnings function developed by Jacob Mincer (1974), which in its pure form specifies the natural logarithm of annual earnings to be a linear function of years of schooling and a quadratic function of labor market experience.[3] We modify the pure Mincerian earnings function in five ways.

First, we measure the specific effect of seniority at MSU (job tenure), in contrast to total labor market experience, by including years at MSU (*SENIORITY*) nonlinearly as explained below. Second, we include a measure of the opportunity wage—specifically the (log of) average salary of tenure system assistant professors in the faculty member's field at other AAU universities (ln *AAUSAL*). Third, for faculty with a doctorate, we include measures of total labor market experience (at MSU and elsewhere) both before and after obtaining the doctorate (*EXPREDOC* and *EXPOSTDOC*), in a functional form discussed further below. For faculty who have not obtained a doctorate, we include a standard quadratic function of experience, (*OTHEREXP* and $OTHEREXP^2$). Fourth, our only "schooling" variable is whether the faculty member had *not* obtained a doctorate (*NO DOCTORATE*). Finally, we include a set of J control variables (X_j, $j = 1, \ldots, J$) to capture the effects of appointment status (for example, percentage less than full time and whether the faculty member was on 12-month or 10-month appointment), and individual characteristics such as veteran status, handicapper status, and ethnicity.

Accordingly, the salary functions we estimate can be written:

$$\begin{aligned} \ln SALARY = {} & a_0 + a_1(SENIORITY/100) + a_2(SENIORITY^2)/1000 \\ & + (\ln AAUSAL)[a_3 + a_4(SENIORITY/10) + a_5(SENIORITY^2/100)] + \\ & b_1(EXPREDOC/100) + b_2(EXPREDOC^2/1000) + b_3(EXPOSTDOC/100) + \\ & b_4(EXPOSTDOC^2/1000) + b_5(EXPREDOC^*EXPOSTDOC/1000) + \\ & b_6(OTHEREXP/100) + b_7(OTHEREXP^2/1000) + \Sigma_j c_j X_j + e \end{aligned} \qquad (1)$$

where the dependent variable (ln *SALARY*) is the natural logarithm of a faculty member's annual contract salary on October 1 of the given year. Definitions of all variables are displayed in

[3]See also Rosen's (1992) highly useful discussion of the development of the Mincerian earnings function.

Table 1. With the exception of ln *AAUSAL*, all variables in equation (1) are specific to faculty member *i* in year *t*, so we have suppressed subscripts for simplicity. The entry-level salary variable (ln *AAUSAL*) is assigned to each faculty member according to his or her *department* in year *t*; it is entered as deviations from the total sample mean in year *t*.

Four features of this specification deserve further mention. First, an extensive literature (cited in the introduction) has grown in the past decade in which the returns to seniority with a given employer (or job tenure) have been distinguished from the returns to total work experience. In a human capital framework, the returns to seniority have been interpreted as returns to firm-specific training, whereas the returns to total experience have been interpreted as returns to general training, although other interpretations are possible (see the review by Hutchens 1989). For example, Ransom's (1993) findings suggest that greater seniority implies higher mobility costs, which in the presence of monopsony power could lead to lower pay.

Implementing the distinction between seniority and general experience is straightforward in the data we are using: We measure the effect of MSU seniority, in contrast to total postdoctoral experience, by including each faculty member's years at MSU (*SENIORITY*) and its square. (We discuss general experience further below.)

Second, we append to each faculty member's annual record the average salary of assistant professors in his or her field at American Association of Universities (AAU) institutions (ln *AAUSAL*). These data on entry-level market salaries are gathered by the American Association of Universities Data Exchange (AAUDE). We have organized the data for comparability with MSU departments;[4] however, because we do not have AAU salary reports for all fields represented at MSU, our sample size is reduced somewhat.[5] Table 2 lists the included departments, shows the average AAU salary (*AAUSAL*) by field for 1981, 1986, and 1990 for participating institutions (excluding MSU), and gives the average annual growth rates of salaries between 1981 and 1990.[6]

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[4]This means that the number of schools on which the "market" salary is based varies by field. It is not uncommon for a university to supply data to AAU for some of its departments and not others. In addition, the number of responding universities in a field varies from year to year, with a trend toward more universities participating in the data exchange in later years. We have also constructed average salaries for just the Big Ten universities (a more consistent sample) and have used them to obtain estimates. The results are essential similar.

[5]Elimination of faculty from the sample due to missing AAU salary information reduced the sample size by 32 percent in 1981, 23 percent in 1986, and 19 percent in 1990. Thevast majority of the loss was in medical school faculty. See Table 2 for missing departments in 1981.

[6]An alternative way to measure the effect on salary of being in a particular field is to include in the regression a set of dummy variables for academic departments. The coefficients of the dummy variables then measure percentage differences in salary across departments. We implemented this approachbefore we acquired the AAU data, and have found that the AAU data do equally well in explaining interdepartmental variation in salaries. Hence,using the AAU salary variable is preferred both on economic grounds and for reasons of parsimony (one variable rather than 50-odd).

The market salary data are interesting in their own right for what they reveal about the academic labor market over the 1980s. The biggest winners—those with annual salary growth rates above 7 percent—were certain fields in business (finance, accounting, marketing, and management) and engineering (computer science and electrical engineering). A sprinkling of other fields—chemical and civil engineering, geography, and labor and industrial relations—fared nearly as well. Faculty in most of these fields had existing or improving opportunities outside academe, explaining their relatively rapid salary increases.

Fields that fared relatively poorly—with annual salary growth rates under 6 percent—tended to be concentrated in agriculture and natural resources, the natural sciences and nursing, and the arts and humanities. Again, opportunities outside academe—or lack of such opportunities—go far toward explaining the composition of fields in this list.

In equation (1), we include the natural logarithm of the AAU entry-level salary for a faculty member's field (ln *AAUSAL*), and interact ln *AAUSAL* with both *SENIORITY* and the square of *SENIORITY*. This interaction allows the impact of market salary on the current salary of senior faculty to vary with seniority. If mobility costs of faculty increase with seniority, and if the university has monopsony power to exercise, then we would expect the influence of increases in AAU market salaries on the salaries of senior faculty to fall as seniority rises.

Third, the specification includes two sets of general experience variables—one for faculty members who have a doctorate and another for those who do not. For faculty who have a doctorate, we follow Johnson and Stafford (1974) in distinguishing between labor market experience obtained *before* receipt of the doctorate and experience obtained *after* receipt of the doctorate. This distinction is important because predoctoral skills and experience often cannot be transferred to the profession that is pursued after the doctorate. If this is so, then we would expect a substantial difference between the estimated returns to experience obtained *before* and *after* the doctorate. Accordingly, we include the number of years of experience before receiving the doctorate and its square (*EXPREDOC* and $EXPREDOC^2$), the number of years of experience since receiving the doctorate and its square (*EXPOSTDOC* and $EXPOSTDOC^2$), and the interaction pre- and postdoctoral experience. In general, we expect to find higher returns to postdoctoral than to predoctoral experience ($b_3 > b_1 > 0$), with diminishing returns to both (b_2, $b_4 < 0$), and with faculty who obtained their doctorate later in their life earning a lower return to postdoctoral experience ($b_5 < 0$). For faculty who have not obtained the doctorate, we include a standard quadratic function of experience (*OTHEREXP* and $OTHEREXP^2$).

Fourth, given the way we have specified the variables, the intercept of equation (1) has a direct interpretation for each subsample. Specifically, the intercept, a_0, is the ln *SALARY* of a white, untenured assistant professor who has just earned a doctorate and arrived at MSU straight from graduate school (that is, has no MSU seniority or postdoctoral experience), is not a department chair, is on a full-time academic year appointment, is not a military veteran, is not

handicapped, and is in the field with the average market (AAU) salary.[7] Since it makes sense to observe returns to seniority and experience with respect to an entry-level faculty member, this average white assistant professor makes a natural "reference" faculty member.

III. Results of Estimation

Tables 3 and 4 display estimates of the coefficients of main interest in equation (1), for tenure system faculty men and tenure system faculty women in 1981, 1986, and 1990. Separate salary functions for men and women allow all coefficients to be different for faculty men and women, and this flexibility turns out to be important in interpreting differences between faculty men and women in salary determination.

Depending on the year, the estimated salary functions explain between 58 and 72 percent of the variation in individual tenure system faculty salaries. This explanatory power is striking, given that the regressions include only seniority, the opportunity wage (AAU market salary), postdoctoral experience, and a few other explanatory variables (not displayed in the tables).

A. Returns to Seniority and Experience

What are the returns to seniority and postdoctoral experience for this group of university faculty? Have the wage-tenure and wage-experience profiles changed over the years? Do they differ for men and women? Table 5 displays wage-tenure and wage-experience profiles based on the estimated coefficients shown in Tables 3 and 4. Specifically, Table 5 shows the difference in ln *SALARY* between a faculty member with no seniority (top panel) or postdoctoral experience (middle panel) and a faculty member with 5, 10, 15, 20, and 25 years of seniority or postdoctoral experience (see the notes to Table 5 for computational details). Since equation (1) is in logarithmic terms, these can be read as approximate proportional salary differences (so that -0.02 is a negative differential of 2 percent). Different profiles are shown for 1981, 1986, and 1990.

1. *Returns to seniority.* The top panel of Table 5 shows that (usually) greater seniority reduces faculty salaries, other things equal. To understand these estimated wage-tenure profiles, consider 6 faculty men with 25 years of postdoctoral experience. The first has just been hired by the university, the second has 5 years of university seniority, and the others have 10, 15, 20, and 25 years of seniority, respectively. In 1990, the faculty member with 5 years of seniority would have earned 3 percent less than the newly hired faculty member, the faculty member with 10 years of seniority would have earned 6 percent less than the newly hired faculty member, and so on, as shown in the 1990 row of the top panel of Table 5.

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[7]A number of studies have related salaries and salary increases to research productivity measured by citations of published work; for example, Hamermesh (1989). But for some departments, such as music and art, citations would not be a very good proxy for productivity. The same is true of departments with lower research expectations but a heavy commitment to public service or extension work.

The returns to seniority fell dramatically for both faculty men and women during the 1980s. They are particularly large and negative for *men* in 1986 and 1990. For example, 25 years of university seniority reduced a faculty man's salary by 15 percent in 1986 and by 13 percent in 1990. The only positive returns to seniority are for faculty women in 1981.

2. *Returns to experience.* The middle panel of Table 5 shows the returns to postdoctoral experience (with *SENIORITY* set to 0). To understand these wage-experience profiles, consider six faculty members who have just been appointed to the university. The first has just left graduate school and has no postdoctoral experience, the second has 5 years of postdoctoral experience, and the others have 10, 15, 20, and 25 years of experience, respectively. In 1990, the new hire with 5 years of experience would have earned 15 percent more than the new hire just out of graduate school, the new hire with 10 years of experience would have earned 29 percent more than the new hire just out of graduate school, and so on, as shown in the 1990 row of the middle panel of Table 5.

Table 5 shows that, for men, the returns to experience fell during the 1980s. For example, a faculty man joining the university with 25 years of experience in 1981 earned 66 percent more than a new Ph.D.; by 1990 the premium was only 56 percent.

Women, on the other hand, saw an increase in returns to experience over the decade. For example, the return to 25 years of postdoctoral experience rose from 38 percent in 1981 to 45 percent in 1990.

3. *Total returns.* The bottom panel of Table 5 shows the combined effects of seniority and postdoctoral experience. Here, we assume seniority equals postdoctoral experience and sum the returns to each. The estimates suggest that the return to 25 years of combined seniority and postdoctoral experience fell over the decade from 61 to 43 percent for men, and from 54 to 39 percent for women.

What can account for these declining returns to seniority and postdoctoral experience? On the supply side of faculty labor markets, the output of new Ph.D.s fell dramatically during the 1980s, partly because of demographic shifts (there were fewer men and women of traditional graduate school age as the decade progressed), and partly because of reduced expectations about employment prospects (Bowen and Sosa, 1989, chapter 6). This tightening supply, along with normal flows of faculty turnover (retirement and other forms of attrition), put upward pressure on starting salaries for new Ph.D.s in many fields.

On the demand side, the 1980s were a time of contraction for higher education generally as enrollments fell (Bowen and Sosa, 1989, chapter 3). Public higher education in Michigan was subject to the same pressures as the "industry" as a whole. In addition, the Michigan economy suffered from high unemployment early in the decade and went through major restructuring as the decade progressed. State support for public higher education suffered accordingly.

So it seems likely that the collapsing returns to seniority and postdoctoral experience seen in Table 5 resulted from an effort by deans and other administrators to pay competitive salaries to new faculty in the face of stagnating budgets. This could be viewed either as exploiting the presence of mobility costs for faculty with many years of postdoctoral experience (Ransom 1993), or as squeezing out some of the economic rents that may be associated with academic tenure (the promise of a lifetime job).

B. Faculty Salaries and External Labor Markets

How responsive are the salaries of senior faculty to changes in the market for entry-level faculty? We address this question by using the estimates of equation (1) to compute the elasticity of current salary (i.e., the salary of senior faculty) with respect to the entry-level salary in that faculty member's field (i.e., the average salary of assistant professors in AAU institutions). Since this elasticity varies with seniority, we denote it by η_{SEN} and retrieve it from equation (1) by differentiating with respect to ln *AAUSAL*:

$$\begin{aligned} \eta_{SEN} &= \partial \ln SALARY / \partial \ln AAUSAL \\ &= a_3 + a_4(SENIORITY/10) + a_5(SENIORITY^2/100). \end{aligned} \tag{2}$$

Equation (2) makes clear the dependence of η_{SEN} on the level of seniority of a faculty member.

Table 6 gives estimates of η_{SEN} for tenure system faculty by gender for different levels of seniority. For example, suppose that the AAU market salary increased by 10 percent in Economics in 1990. Then a male Economics professor with 10 years of seniority would expect to realize a salary increase of about 6.5 percent (since η_{10} equals .65 in 1990).

Four points about the relationship between the external labor market and salaries of senior faculty seem clear. First, the greater is seniority, the less a change in market wages tends to influence salary. That is, η_{SEN} falls as seniority rises. A woman in 1990 with 5 years of seniority would see her salary rise by 52 percent of an increase the entry-level salary. But a woman with 15 years seniority would see an increase of only 5 percent of the entry-level increase. Rapid increases in market salaries therefore lead to salary compression—booming fields will see smaller pay gaps between senior and junior faculty than will fields with modest market wage increases. That η_{SEN} falls with seniority is consistent with Ransom's hypotheses about faculty members' lack of mobility and universities' exercise of monopsony power.

Second, the salaries of senior faculty men tend to be more responsive to changes in entry-level salaries than are the salaries of senior faculty women. That is, η_{SEN} is greater for men than women for any given level of seniority. In 1990, for example, η_{10} was .65 for men but only .24 for women. This has implications for the gender gap in wages: For faculty members in fields with rapidly rising salaries, say finance or engineering, the evidence suggests that senior faculty men would tend to enjoy a larger salary boost than faculty women.

Third (and related to the second point), the decrease in η_{SEN} as seniority increases is markedly greater for women than for men. That is, as we read across comparable rows of Table 6, the reduction in elasticity with increased seniority is more pronounced for women. For men in 1990, η_{SEN} fell from .69 to .59 as seniority rose from 5 to 15 years, but for women it plummeted from .52 to .05. Senior faculty women are less successful than senior faculty men in obtaining salary increases when the market for their field improves. So the gender gap in wages should tend to increase with seniority.

Finally, salaries of senior faculty men tended to be more responsive to entry-level salaries in 1990 than in 1981, but salaries of senior faculty women became less responsive. The difference between faculty men and women may be explainable by the concentration of women in relatively low-paying fields; that is, fields in which the labor market was relatively slack, such as English, history, and other humanities. The argument is as follows. The 1980s were a time of tight budgets in most universities, so that administrative decisions were more constrained by—and had to respond more to—the market. With tight budgets, administrators look at departments whose markets are slack and are unlikely to provide salary adjustments in excess of the bare minimum needed to retain faculty. But they may need to provide significant salary adjustments to departments operating in tight markets even in difficult times in order to recruit and retain faculty. Tight budgets, then, should lead to both greater salary dispersion across departments and greater internal responsiveness to external faculty labor markets. Since, again, faculty women tend to be in slack segments of the faculty labor market, we would expect to see the salaries of senior faculty women respond less to changes in the entry-level market.

These results make two points clear. First, the elasticity of senior faculty salaries with respect to entry-level salaries (η_{SEN}) falls with seniority, consistent with Ransom's hypotheses about faculty members' lack of mobility and universities' exercise of monopsony power. Second, η_{SEN} is greater for men than for women, falls more rapidly for women than for men, and increased for men during the 1980s (whereas it fell for women). These findings suggest that gender-based pay gaps may be complex in origin, and that policies to reduce such gaps may be subverted in subtle ways by interactions between the external and internal labor markets of the university.

C. Wage-Tenure Profiles and the External Labor Market

The results in Table 6 show that the elasticity of senior faculty salaries with respect to entry-level salaries (η_{SEN}) is always less than 1 and falls with seniority. It follows that in higher-wage fields that are experiencing wage growth, we would expect to see relatively small wage gaps between junior and senior faculty—that is, salary compression or relatively low returns to seniority. In lower-wage fields that are stagnating, we would expect higher (or less negative) returns to seniority.

Calculations displayed in Table 7 bear out these expectations. Using the AAU salary data in Table 2, we have chosen three fields—Accounting, Chemistry, and Social Work—to represent

fields in which salaries grew at high, medium, and low rates during the 1980s. Table 7 shows the wage-tenure profiles for faculty men in these three fields in 1981, 1986, and 1990 (see the table notes for computational details).

In the low- and medium-growth fields, Social Work and Chemistry, the returns to 25 years of seniority were -10 to -12 percent in 1986 and 1990. These are substantial negative returns, but they are dwarfed by the negative returns to seniority that are experienced by Accounting professors: Accounting faculty with just 10 years of seniority had returns of -8 to -16 percent during the 1980s; those with 20 years of seniority had returns of -18 to -35 percent. The booming entry-level market for Accounting faculty led to salary compression with a vengeance.

In summary, the wage-tenure profile is sensitive to conditions in the external labor market. This sensitivity suggests the importance of accounting for occupational market conditions in constructing and evaluating wage-tenure profiles. The average wage-tenure profiles that have been examined in most work on the subject may mask variation that is important to understanding the relationship between wages and seniority.

IV. Discussion and Conclusions

Most existing evidence suggests that wages rise with job tenure, although the reason for the rising wage-tenure profile has been widely debated. Ransom (1993) has shown that at least one nonnegligible segment of the labor market—the market for college and university professors—experiences negative returns to job tenure. As Ransom points out, these negative returns are consistent with the existence of mobility costs for faculty and the exercise of monopsony power by universities. Hallock (1995) examines one university where the returns to seniority appear not to be negative. We show that there is variation in the returns to seniority over time within a university (Table 5), and that variations in the conditions of the entry market in an academic field can influence the wage-tenure profile (Tables 6 and 7).

The finding of a flat or negative return to job tenure suggests the unimportance of university-specific skills in academic labor markets. Because the teaching and research skills of university professors are readily transferrable from one setting to another, this unimportance makes sense. It is, of course, both a bane and a blessing: It allows faculty to take leaves of absence and sabbaticals in exotic (and less than exotic) locales, but it leads to a situation where immobility is taken as a signal of weak general skills.

It seems likely that university faculty and other Ph.D.-level professionals whose work centers on knowledge, information, and research are unusual in having jobs in which general skills are so important, and specific skills so unimportant. Many other professionals who have post-baccalaureate training, such as physicians and lawyers, maintain on-going relationships with patients and clients, face licensing requirements, and deal with state-specific institutional peculiarities, all of which suggest the importance of specific skills. We would also speculate that

engineers and other scientific personnel in the private sector would experience the positive returns to job tenure that have been documented generally (e.g., Topel 1991), since they often work in organizations that use unique or specialized processes.

The declining returns to both seniority and postdoctoral experience that are documented in Table 5 confirm the widespread belief that the 1980s were a period of salary compression among academics; that is, a time when pay gaps between junior and senior faculty narrowed.[8] We speculate that two main factors are responsible for this salary compression: falling supplies of new Ph.D.s in many fields, and tightening university budgets, which led administrators to meet the demand for replacement faculty by paying competitive (and higher) entry level salaries and allowing existing pay gaps between experienced and inexperienced faculty to shrink. In particular, rapid increases in starting salaries in business and scientific fields (including engineering) appear to have pulled up campus-wide average salaries while only marginally benefitting more experienced faculty or faculty outside of business and science. Hence, the growth of starting salaries in some fields may have led to both salary compression and greater pay disparities across fields.

In addition to examining the returns to seniority, we have examined the relationship between entry-level salaries and the salaries of senior faculty. Our results (see Table 6) suggest that the elasticity of senior faculty salaries with respect to the entry-level salary (η_{SEN}) falls with seniority, is greater for men than for women, falls more rapidly for women than for men, and increased for men during the 1980s (whereas it fell for women). To our knowledge, these are the first estimates of this kind. Presumably, salary compression would have been even greater than it actually was during the 1980s if η_{SEN} had not increased for faculty men during the decade.

Finally, we examine the sensitivity of the wage-tenure profile in a given field to the conditions in the entry-level market in that field (Table 7). As expected, the returns to seniority are far more negative in a booming field (such as Accounting) than in low- and medium-growth fields (such as Social Work and Chemistry). Salary compression, then, is far greater in fields that have a booming entry-level market than in other fields. This sensitivity of the wage-tenure profile to conditions in the external labor market suggests the importance of accounting for market conditions in an occupation when constructing and evaluating wage-tenure profiles.

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[8]Although much discussed in faculty clubs, there has been little written on salary compression and differences across disciplines. For an exception, see Hamermesh (1988).

References

Abraham, Katharine G. and Henry S. Farber. "Job Duration, Seniority, and Earnings." *American Economic Review* 77 (June 1987): 278-297.

Altonji, Joseph and Robert Shakotko. "Do Wages Rise with Job Seniority?" *Review of Economic Studies* 54 (July 1987): 437-459.

Becker, Gary S. *Human Capital*, second edition. Chicago, Illinois: University of Chicago Press, 1975.

Bowen, William G. and Julie Ann Sosa. *Prospects for Faculty in the Arts and Sciences.* Princeton, New Jersey: Princeton University Press, 1989.

Brown, James N. "Why Do Wages Increase with Tenure? On-the-Job Training and Life-Cycle Wage Growth Observed Within Firms." *American Economic Review* 79 (December 1989): 971-991.

Hallock, Kevin F. "Seniority and Monopsony in the Academic Labor Market." *American Economic Review* 83 (June 1995): 654-657.

Hamermesh, Daniel S. "Salaries: Disciplinary Differences and Rank Injustices." *Academe* (May-June 1988): 20-24.

Hamermesh, Daniel S. "Why Do Individual-Effects Models Perform So Poorly? The Case of Academic Salaries." *Southern Economic Journal* 56 (July 1989): 39-45.

Hashimoto, Masanori. "Firm-Specific Human Capital as a Shared Investment." *American Economic Review* 71 (June 1981): 475-482.

Hutchens, Robert M. "A Test of Lazear's Delayed Payment Contracts." *Journal of Labor Economics* 5 (October 1987, Part 2): S153-170.

Hutchens, Robert M. "Seniority, Wages, and Productivity: A Turbulent Decade." *Journal of Economic Perspectives* 3 (Fall 1989): 49-64.

Jacobson, Louis, Robert LaLonde, and Daniel Sullivan. *The Costs of Worker Dislocation.* Kalamazoo, MI: W.E. Upjohn Institute, 1993a.

Jacobson, Louis, Robert LaLonde, and Daniel Sullivan. "Earnings Losses of Displace Workers." *American Economic Review* 83 (September 1993b): 685-709.

Jacobson, Louis, Robert LaLonde, and Daniel Sullivan. "Long-Term Earnings Losses of High-Seniority Displaced Workers." *Federal Reserve Bank of Chicago Economic Perspectives* 17 (November/December 1993): 2-20.

Johnson, George E. and Frank P. Stafford. "Lifetime Earnings in a Professional Labor Market: Academic Economists." *Journal of Political Economy* 82 (1974): 549-569.

Jovanovic, Boyan. "Job Matching and the Theory of the Firm." *Journal of Political Economy* 87 (October 1979): 972-990.

Lazear, Edward P. Agency, Earnings Profiles, Productivity, and Hours Restrictions." *American Economic Review* 71 (September 1981): 606-620.

Mincer, Jacob. *Schooling, Experience, and Earnings*. New York: National Bureau of Economic Research and Columbia University Press, 1974.

Oi, Walter. "Labor as a Quasi-Fixed Factor." *Journal of Political Economy* 70 (December 1962): 538-555.

Osterman, Paul S. "Internal Labor Markets: Theory and Change." In *Labor Economics and Industrial Relations: Markets and Institutions*, edited by Clark Kerr and Paul D. Staudohar. Cambridge, Massachusetts: Harvard University Press, 1994. Pp. 303-339.

Ransom, Michael R. "Seniority and Monopsony in the Academic Labor Market." *American Economic Review* 83 (March 1993): 221-233.

Rosen, Sherwin. "Mincering Labor Economics." *Journal of Economic Perspectives* 6 (Spring 1992): 157-170.

Topel, Robert. "Specific Capital, Mobility, and Wages: Wages Rise with Job Seniority." *Journal of Political Economy* 99 (February 1991): 145-176.

Table 1
Variable Definitions

Dependent Variable		
ln *SALARY*	=	natural logarithm of annual salary on October 1 of each year.
Job Tenure		
SENIORITY	=	number of years since first faculty appointment at MSU (excluding years of nonappointment after initial appointment).
Opportunity Wage		
ln *AAUSAL*	=	natural logarithm of the average salary of assistant professors in AAU universities, in the faculty member's field.
Experience		
EXPREDOC		For persons with doctorate, number of years in excess of four taken to obtain the doctorate. Equals 0 for persons without doctorate.
EXPOSTDOC		For persons with doctorate, years of experience since receiving doctorate. If year of doctorate is unknown, we assumed it was received at age 26. Equals 0 for persons without doctorate.
OTHEREXP		For persons without doctorate, years of experience since highest degree. Equals 0 for persons with doctorate.
Degree status		
NO DOCTORATE	=	1 if person lacks doctorate, else 0.
Appointment status		
CHAIR/DIRECTOR	=	1 if person is a chairperson or a director, else 0.
ASST CHAIR/ DIRECTOR	=	1 if person is an assistant chairperson or assistant director, else 0.
DISTINGUISHED	=	1 if person holds a "distinguished" rank, else 0.
12 MONTH	=	1 if on 12 month appointment, else 0.
% < FULL TIME	=	100 minus percent time employed.
Ethnicity		
BLACK	=	1 if Black, else 0.
ASIAN	=	1 if Asian/Pacific Islander, else 0.
HISPANIC	=	1 if Hispanic, else 0.
NATIVE	=	1 if Native American, else 0.
OTHER	=	1 if other ethnicity, else 0.
Veteral Status		
VNVET	=	1 if Viet Nam veteran, else 0.
NONVNVET	=	1 if veteran, but not Viet Nam veteran, else 0.
Handicapper Status		
HCAPACC	=	1 if handicapped and special accommodation is required, else 0.
HCAPNAC	=	1 if handicapped and no special accommodation is required, else 0.

Table 2
AAU Average Salaries of Assistant Professors
by Department, Excluding MSU

	1981	1986	1990	Avg. Annual Growth Rate 1981-90
Twelve Month Departments:				
Agriculture and Natural Resources				
Agriculture Economics	28590	36820	45518	5.30
Agriculture Engineering	28367	40398	49614	6.41
Animal Science	na	36483	45297	6.34*
Crop & Soil Science	26727	36165	44524	5.83
Forestry	26829	33876	42446	5.23
Botany & Plant Pathology	26402	35997	43653	5.75
Food Science	26700	34403	43680	5.62
Communication Arts				
Audiology	25934	29534	39297	4.73
Natural Sciences				
Microbiology	30502	38920	48877	5.38
Entomology	26869	34952	44631	5.80
Biochemistry	28608	34535	44562	5.05
Medical Sciences				
Pharmacology	29774	37480	45934	4.94
Physiology	30387	38755	50365	5.77
Anatomy	29891	37876	45248	4.71
Ten Month Departments:				
Arts and Humanities				
Art	18730	24418	31358	5.89
English	19135	24789	31179	5.57
History	19830	25994	32395	5.60
Linguistics	na	25850	32557	5.44**
Music	19467	25310	31378	5.45
Philosophy	19030	25483	33483	6.48
Roman & Classical Languages	19473	25129	31716	5.57
Theatre	19515	25261	30873	5.23
Business				
Accounting	28764	44479	59414	8.39
Economics	22982	32797	41979	6.92
Finance	na	40767	58770	8.58*
Management	26817	39573	53297	7.93
Marketing & Trans. Admin.	26435	37445	51160	7.61
Communication Arts				
Communication	20099	26484	33345	5.79
Journalism	21541	28803	35399	5.67

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Table 2
(Continued)

	1981	1986	1990	Avg. Annual Growth Rate 1981-90
Ten Month Departments (Continued):				
Education				
Education Administration	na	31468	36587	6.64*
Couns. & Ed. Psychology	na	26595	34595	6.01*
Physical Education & Exercise	20616	26990	33771	5.64
Science				
Teacher Education	na	27203	33985	5.96*
Engineering				
Chemical Engineering	27300	39383	49330	6.79
Civil Engineering	25228	36624	46165	6.94
Computer Science	25946	39543	47985	7.07
Electrical Engineering	26637	40375	49542	7.14
Mechanical Engineering	26676	38829	46816	6.45
Met., Mech. & Mat. Sci.	26136	38393	47385	6.83
Natural Science				
Chemistry	21539	29869	38009	6.51
Geology	23203	29870	36372	5.12
Mathematics	20773	28381	36714	6.53
Microbiology & P.H.	24805	31631	38741	5.08
Physics	23396	32977	41500	6.58
Statistics	23079	29532	39245	6.08
Zoology	22150	30183	38285	6.27
Social Sciences				
Anthropology	20180	30696	32278	5.36
Geography	19923	28375	35973	6.79
Labor & Industrial Relations	25588	30239	49175	7.53
Political Science	20528	27059	34592	5.97
Psychology	19708	27349	34807	6.52
Sociology	19839	26782	35189	6.57
Social Work	23124	28847	34918	4.69
Medical Sciences				
Nursing	20684	29449	37052	6.69

* Based on 1983 salaries. ** Based on 1982 salaries.

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Table 3
Estimated Earnings Functions for Tenure System Men Faculty, 1981, 1986, and 1990
(Dependent variable = ln *SALARY*)

	1981		1986		1990	
	Mean (Std. Dev.)	OLS Coefficient (Std. Error)	Mean (Std. Dev.)	OLS Coefficient (Std. Error)	Mean (Std. Dev.)	OLS Coefficient (Std. Error)
INTERCEPT	1.000 (--)	9.923 (0.020)	1.000 (--)	10.294 (0.024)	1.000 (--)	10.544 (0.029)
Job Tenure						
SENIORITY/100 *(mean unscaled)*	15.349 (8.983)	-0.338 (0.267)	16.551 (9.558)	-0.992 (0.277)	17.548 (9.794)	-0.734 (0.297)
SENIORITY^2/1000	--	0.049 (0.064)	--	0.154 (0.067)	--	0.087 (0.076)
Opportunity wage						
ln *AAUSAL* (dev. from total sample mean)	0.011 (0.155)	0.704 (0.094)	0.020 (0.165)	0.910 (0.087)	0.023 (0.168)	0.724 (0.099)
ln *AAUSAL*SENIORITY*/10	--	-0.234 (0.111)	--	-0.226 (0.107)	--	-0.053 (0.124)
ln *AAUSAL*SENIORITY*^{2}/100	--	-0.003 (0.029)	--	-0.002 (0.030)	--	-0.024 (0.034)
Experience						
EXPREDOC/100 *(mean unscaled)*	3.716 (4.133)	-0.264 (0.380)	3.861 (3.958)	-0.671 (0.451)	3.976 (4.072)	-0.478 (0.512)
EXPREDOC^2/1000	--	0.356 (0.154)	--	0.536 (0.200)	--	0.201 (0.194)
EXPOSTDOC/100 *(mean unscaled)*	15.111 (9.694)	4.332 (0.299)	16.595 (10.320)	3.931 (0.326)	17.721 (10.302)	3.387 (0.365)
EXPOSTDOC^2/1000	--	-0.605 (0.067)	--	-0.520 (0.071)	--	-0.421 (0.081)
*EXPREDOC*EXPOSTDOC*/1000	--	-0.366 (0.150)	--	-0.290 (0.166)	--	-0.226 (0.190)
OTHEREXP/100	1.423 (6.093)	2.335 (0.326)	1.351 (6.056)	2.266 (0.373)	1.187 (5.820)	2.379 (0.451)
OTHEREXP^2/1000	--	-0.282 (0.047)	--	-0.233 (0.049)	--	-0.221 (0.053)
Adjusted R^2		0.724		0.647		0.581
Sample size		1035		1156		1163

Notes: The equations also control for each faculty member's degree status, appointment status, ethnicity, veteran status, and handicapper status. Table 1 provides definitions of all included variables.

Table 4
Estimated Earnings Functions for Tenure System Faculty Women, 1981, 1986, and 1990
(Dependent variable = ln *SALARY*)

	1981		1986		1990	
	Mean (Std. Dev.)	OLS Coefficient (Std. Error)	Mean (Std. Dev.)	OLS Coefficient (Std. Error)	Mean (Std. Dev.)	OLS Coefficient (Std. Error)
INTERCEPT	1.000 (--)	9.899 (0.046)	1.000 (--)	10.232 (0.044)	1.000 (--)	10.471 (0.040)
Job Tenure						
SENIORITY/100 *(mean unscaled)*	9.703 (7.725)	1.908 (0.600)	10.834 (7.817)	-0.395 (0.595)	10.887 (8.021)	-0.909 (0.526)
SENIORITY^2/1000	--	-0.503 (0.174)	--	0.162 (0.192)	--	0.263 (0.174)
Opportunity wage						
ln *AAUSAL* (dev. from total sample mean)	-0.053 (0.144)	0.910 (0.178)	-0.058 (0.139)	0.889 (0.160)	-0.050 (0.148)	0.898 (0.159)
ln *AAUSAL*SENIORITY*/10	--	-0.672 (0.280)	--	-0.767 (0.299)	--	-0.854 (0.290)
ln *AAUSAL*SENIORITY*^{2}/100	--	0.120 (0.077)	--	0.194 (0.108)	--	0.192 (0.099)
Experience						
EXPREDOC/100 *(mean unscaled)*	3.277 (4.453)	0.802 (0.911)	4.461 (5.052)	-0.202 (0.780)	5.766 (6.320)	0.554 (0.423)
EXPREDOC^2/1000	--	-0.696 (0.423)	--	0.345 (0.310)	--	-0.041 (0.079)
EXPOSTDOC/100 *(mean unscaled)*	6.342 (8.056)	1.310 (0.772)	8.115 (7.873)	3.265 (0.668)	10.148 (8.332)	3.232 (0.586)
EXPOSTDOC^2/1000	--	0.033 (0.232)	--	-0.425 (0.199)	--	-0.487 (0.176)
*EXPREDOC*EXPOSTDOC*/1000	--	0.239 (0.515)	--	-0.454 (0.349)	--	-0.409 (0.263)
OTHEREXP/100	4.626 (8.398)	0.050 (0.747)	4.074 (9.088)	0.491 (1.051)	2.271 (7.257)	0.802 (1.231)
OTHEREXP^2/1000	--	0.236 (0.217)	--	0.114 (0.245)	--	0.031 (0.289)
Adjusted R^2		0.711		0.642		0.622
Sample size		155		217		291

Notes: See Table 3.

Table 5
Returns to Seniority and Postdoctoral Experience
for Tenure System Faculty

	Men					Women				
	Years of Seniority or Postdoctoral Experience					Years of Seniority or Postdoctoral Experience				
Year	5	10	15	20	25	5	10	15	20	25
Returns to Seniority (holding postdoctoral experience constant)										
1981	-0.02	-0.03	-0.04	-0.05	-0.06	0.10	0.17	0.21	0.23	0.21
1986	-0.05	-0.09	-0.12	-0.15	-0.16	0.00	0.01	0.02	0.03	0.04
1990	-0.04	-0.07	-0.09	-0.12	-0.14	-0.02	-0.03	-0.03	-0.03	-0.02
Returns to Postdoctoral Experience (setting *SENIORITY*=0)										
1981	0.20	0.36	0.49	0.60	0.67	0.07	0.14	0.22	0.20	0.37
1986	0.18	0.33	0.46	0.56	0.63	0.14	0.26	0.36	0.44	0.50
1990	0.15	0.29	0.40	0.49	0.56	0.14	0.25	0.34	0.40	0.44
Total Returns when *EXPOSTDOC*=*SENIORITY*										
1981	0.18	0.33	0.45	0.54	0.61	0.17	0.31	0.43	0.52	0.58
1986	0.13	0.24	0.33	0.41	0.47	0.15	0.27	0.38	0.47	0.54
1990	0.12	0.22	0.31	0.37	0.43	0.12	0.22	0.31	0.38	0.43

Notes: Returns to seniority (top panel) are computed from the estimates in Tables 3 and 4 by setting ln *AAUSAL* equal to the subgroup mean (.011, .020, and .023 for men in 1981, 1986, and 1990; -.053, -.058, and -.050 for women in 1981, 1986, and 1990) and setting all other right-hand-side variables in equation (1) to zero, except *SENIORITY*. When *SENIORITY* is then set to 5, 10, 15, 20, and 25, equation (1) yields estimates of the proportional returns to 5, 10, 15, 20, and 25 years of seniority. Returns to postdoctoral experience (middle panel) are computed similarly: Set all right-hand-side variables in equation (1) to zero, except *EXPOSTDOC*, which is set to 5, 10, 15, 20, and 25 to yield estimates of the returns to 5, 10, 15, 20, and 25 years of postdoctoral experience (the sample mean of *EXPREDOC* is used in the *EXPREDOC*EXPOSTDOC* interaction term). Total returns (bottom panel) are the sum of returns to seniority and postdoctoral experience.

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Table 6
Elasticity of Senior Faculty Salaries with Respect to
Entry-Level Salary (η_{SEN}), by Gender and Seniority

	Tenure System Men Years of Seniority					Tenure System Women Years of Seniority				
Year	0	5	10	15	20	0	5	10	15	20
1981	0.70	0.59	0.47	0.35	0.22	0.91	0.60	0.36	0.17	0.05
1986	0.91	0.80	0.68	0.57	0.45	0.89	0.55	0.32	0.18	0.13
1990	0.72	0.69	0.65	0.59	0.52	0.90	0.52	0.24	0.05	-0.04

Notes: The elasticities are derived from the estimated earnings functions in Tables 3 and 4 by setting *SENIORITY* equal to the specified number of years (0, 5, 10, 15, or 20), and differentiating with respect to ln *AAUSAL*.

Table 7
Wage-Tenure Profiles for Faculty Men in Low-, Medium-,and High-Growth Fields

	Years of Seniority				
	5	10	15	20	25
Social Work					
1981	-0.01	-0.03	-0.03	-0.04	-0.05
1986	-0.04	-0.06	-0.09	-0.10	-0.10
1990	-0.03	-0.06	-0.07	-0.09	-0.10
Chemistry					
1981	-0.01	-0.01	-0.01	-0.01	-0.00
1986	-0.04	-0.07	-0.10	-0.11	-0.12
1990	-0.03	-0.06	-0.09	-0.10	-0.12
Accounting					
1981	-0.04	-0.08	-0.11	-0.15	-0.18
1986	-0.09	-0.16	-0.23	-0.30	-0.35
1990	-0.05	-0.10	-0.14	-0.19	-0.24

Notes: Returns to seniority are computed from the estimates in Tables 3 and 4 by setting ln*AAUSAL* equal to the subgroup mean (-.016, -.084, and -.121 for Social Work in 1981, 1986, and 1990; -.087, -.049, and -.036 for Chemistry in 1981, 1986, and 1990; and .202, .349, and .410 for Accounting in 1981, 1986, and 1990) and setting all other right-hand-side variables in equation (1) to zero, except *SENIORITY*. When *SENIORITY* is then set to 5, 10, 15, 20, and 25, equation (1) yields estimates of the proportional returns to 5, 10, 15, 20, and 25 years of seniority.

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